Term Project Checkpoint A

Matthew Gauden

MSDS 451

Thomas Miller, PhD

10/12/2025

Introduction

In today's economic uncertainty, one must take it upon themselves to do whatever they can to become more financially stable. It is necessary to make safe, smart, and consistent choices when it comes to investing your own money. Most people who invest do not have an unlimited amount of resources to play around with the market, nor do they necessarily have the time or knowledge to become a day trader. This project assumes that the best investment strategy will be one that includes investing long-term in an ETF fund that combines growth and safety. To accomplish this, both the SPY and TLT ETF funds will be combined into my hypothetical ETF fund. Who can use this? Well, anyone. The potential users of the knowledge base and application of my fund will include everyday people who have limited funds, but what to ensure long-term stability for them and their families. The goal will be to perform long-term portfolio optimization using machine learning methods in Python in order to generate long-term returns.

Literature Review

There have been a few people who have conducted research on this topic. Notably John Y. Campbell from Harvard University, Carolin Pfleuger from the University of Chicago, and Luis Viceira, also from Harvard. The three professors have written a paper titled Macroeconomic Drivers of Bond and Equity Risks. This is going to be a large piece of this project due to its relevance to the topic at hand. The paper explores why stocks and government bonds sometimes move together, and sometimes don't, as well as the macroeconomic forces behind each phenomena. This is crucial to my fund due to the fact that the SPY will include equities in the S&P 500, and the TLT includes U.S. government bonds. It is necessary to understand the potential effects the macroeconomy has on these, especially since our average investor has zero control on the shifts that can occur in said economy. It is important for the individual who invests in our fund to understand the nuances of each ETF and how they relate to each other.

In some cases, investment in SPY can generate a generous amount of growth. However, it is entirely susceptible to economic and market downswings. This is why it is necessary to perhaps offset that potential risk with the government bonds included in the TLT fund. The next piece of literature that is important to the fund is the article titled Flight to Quality and Bailouts: Policy Remarks and Literature Review by Ricardo J. Caballero and Pablo Kurlat. Caballero, former chairman of the Economics department at MIT, and Kurlat, a professor at USC, published this review on October 9, 2008. This is a special date due to the fact it was published right in the middle of the financial crisis. This review looks at the importance of Treasuries during financial crises. Again, this coincides with the previous article, due to the fact that there are several macroeconomic drivers that will be out of our investors control, and they must be aware of possible solutions to any potential crises in the future – especially if they're also invested in the SPY.

Methods

The way the portfolio will be diversified across stocks and bonds. Using the SPY ETF, the stocks will be equities in S&P 500. This allows us to have broad market exposure with our allocated funds. Using the SPY, it will allow our target investors – middle-class Americans – to have a diversified portfolio while minimizing the risk associated with individual stocks. The SPY stretches across a vast number of sectors, and has historically served as a reliable benchmark for long-term success. The S&P, and ETFs in general, usually have fairly low management fees. This again supports our mission in providing cost-effective, and smart investing for the average person. The TLT ETF will provide even more security for our investors, as they will be backed by the U.S. government. TLT also provides investors with liquidity if they wish to turn their asset into cash during hard times.

The fund and our investors will employ a buy-and-hold strategy. This coincides with our general philosophy. This strategy will help drown out daily noise, simplify costs, and allow us to disregard short-term distractions.

Results

However, there are downsides to long holding periods. Jeremy Siegel, who wrote Stocks for the Long Run, considered a 20-30 year holding period to be a bulletproof method for investing. It should be noted that much of the data Siegel used was based on the 20th century, and as we know, the 21st century has provided a litany of previously unforeseen challenges. There has been empirical evidence that suggests the usual 20-30 year holding period may not be as profitable as once imagined (Sanderson and Lumpkin-Sowers, 2018). The research our fund has performed thus far has found that an ETF should be given roughly 10 years before a high confidence of positive results can be determined. While researching, our firm found an experiment from professors Rohnn Sanderson and Nancy L. Lumpkin-Sowers from Brescia University and Berea College, respectively. Their experiment, performed in R, combined all publicly traded ETFs via web queries to Yahoo Finance for each ticker by month over the available time range. They found that it takes roughly 10 years to establish a 100% chance of earning a positive return above the principal and approximately 6 years for an ETF to survive the market (Sanderson and Lumpkin-Sowers, 2018). Our portfolio optimization model will be using this as a foundation, and will be simulating if we can find the same positive return in 10 years time using current information and data.

<u>Conclusions</u>

In all, our ETF will provide all types of investors, large and small, with the potential to maximize their returns while minimizing risk as much as we can. To do this, our ETF will combine two types of securities (stocks and bonds) in both the SPY ETF (S&P 500) and the TLT ETF (U.S. Treasury bonds). Machine learning models will be utilized to find the ideal time period for the buy-and-hold strategy. Our biggest concern is finding the ideal period to ensure our investors see positive returns on their initial investment. My biggest concern with the firm moving forward, is possibly having to pivot from the buy-and-hold strategy. Through my research, I have found this may not be as sound an investing method as historically thought. Sanderson and Lumpkin-Sowers (2018) write in the following excerpt:

"Notice that while the probability of a positive return does tend to increase as the holding period extends, there are holding periods where it falls again. For our particular example, ADRD in Table 1 above, and for our sample time frame, buying and holding this ETF over a one year interval is a superior strategy to holding it for four years where the goal is to see positive returns year after year. This was certainly a function of the two very large

bear markets experienced in our sample period; the dotcom bubble in 2000 and the housing crisis in 2007. For our sample period, 68.46% of the possible one-year intervals resulted in a positive return as compared to only 63.72% of the possible four-year holding period intervals. Thus, increasing your time horizon will not always increase your chances of a positive return when looking at the compound return. Indeed, for ADRD it is not until you hold the fund for ten years that the probability of gaining on the principal is one hundred percent. Note that even this holding period gain does not account for inflation or for transaction costs."

The major concern for our ETF is the unpredictable macroeconomic factors that may take place over a long holding period which may result in negative results for our investors.

References

Caballero, Ricardo J., and Pablo D. Kurlat. “Flight to Quality and Bailouts: Policy Remarks and a Literature Review.” *SSRN Electronic Journal*, 2008, economics.mit.edu/files/3344, https://doi.org/10.2139/ssrn.1297456. Accessed 13 Oct. 2025.

Campbell, John Y, et al. “Macroeconomic Drivers of Bond and Equity Risks.” *Journal of Political Economy*, vol. 128, no. 8, 13 Oct. 2025, https://doi.org/10.1086/707766.

Sanderson, Rohnn, and Nancy Lumpkin-Sowers. “Buy and Hold in the New Age of Stock Market Volatility: A Story about ETFs.” *International Journal of Financial Studies*, vol. 6, no. 3, 6 Sept. 2018, p. 79, https://doi.org/10.3390/ijfs6030079. Accessed 13 Oct. 2025.